

REMARKS

Remaining Claims

Nineteen (19) claims (Claims 1 and 4 - 21) are pending in the application. Claims 1, 4 - 13 and 16 - 18 have been amended by the amendment being filed herewith. Claims 6, 14, 15 and 20 stand rejected under 35 USC §112, first paragraph. Claims 1, 4, 5, 7, 9, 13, 17 and 19 stands rejected under 35 USC §112, second paragraph. Claims 1 and 10 are rejected under 35 USC §102(b). Claims 1 - 4, 5, 7, 8, 10 - 13, 16, 17 and 18 stand rejected under 35 USC §103(a). New claim 21 has been added. The Applicants respectfully traverse the rejections and request reconsideration.

Rejection of Claims 6 and 15 under 35 USC §112, first paragraph

Claims 6 and 15 stand rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement. The Examiner states that claims 6 and 15 contain subject matter that is not described in the specification because these claims refer to bipolar junction transistor (BJT) process technology. The Applicants respectfully disagree. The specification repeatedly refers to the use of fabrication technologies other than FET processing technology. For example, when describing the manner in which the present invention enables the size of the protection diode to be determined, page 5 of the specification, lines 5 - 8, states, "[t]he antenna ratio that determines whether or not a protection diode is needed is process-dependent and vendor-dependent. Those skilled in the art will understand the manner in which, for a given process, the antenna ratio can be used to determine whether or not a protection diode is needed." On page 5 of the specification, line 33 through page 6, line 1, states, "[t]he present invention is also process independent and can be applied regardless of the IC process used to create the IC...."

Because the present invention is "process-independent", as stated above, the method described on pages 4 and 5 will work regardless of whether FET or BJT process technology is used, the Applicants respectfully submit that the description of the present invention with respect to FET process technology is adequate to enable a person skilled in the art to apply

the present invention to BJT process technology or any other type of process technology. In addition, the statement in the specification that the present invention is process-dependent and vendor-dependent teaches that the described method can be used with BJT process technology. Furthermore, the specification has been amended on page 6 to specifically refer to BJT process technology. Accordingly, the Applicants respectfully request that this rejection be withdrawn.

Rejection of Claims 14 and 20 under 35 USC §112, first paragraph

Claims 14 and 20 stand rejected under 35 USC §112, first paragraph, as failing to comply with the written description requirement. The Examiner states that these claims fail to meet the written description requirement because the specification does not disclose the protection diode having a preselected size in terms of area. The Applicants respectfully disagree. Equations 1, 2 and 3 describe the relationship between the physical dimensions of conductive signal lines, buffers and protection diodes. Equation 4 describes protection diode area in terms of the antenna ratio, which is described in Equation 3 in terms of the volume of the conductive line and the gate area of the buffer. Because the buffer and line dimensions are known prior to manufacturing, the protection diode area can also be known prior to manufacturing, and thus can be preselected.

Rejection of Claim 1 under 35 USC §112, second paragraph

Claim 1 stands rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that it is unclear if a buffer having an input and buffers being protected are the same or separate. Claim 1 has been amended so that rather than reciting an apparatus comprising a buffer and a protection diode comprised by the buffer, claim 1 recites a buffer comprising a protection diode. Accordingly, the Applicants request that this rejection be withdrawn.

Rejection of Claims 4, 5, 7, 9, 13, 17, and 19 under 35 USC §112, second paragraph

Claims 4, 5, 7, 9, 13, 17, and 19 stand rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that the use of the phrase “at least partially dependent” in these claims is indefinite. The Applicants respectfully disagree. Claim 5 does not contain this phrase. With respect to claims 4, 7, 9, 13, 17 and 19, this basis for using this phrase is clearly supported in the specification.

Pages 4 and 5 of the specification contain three equations that show the relationships between gate area, conductor volume and protection diode area. The protection diode area depends, among other things, on the antenna ratio, as shown in Equation 3 on page 5. The antenna ratio depends on the conductor volume and on the buffer gate area, as shown in Equation 4 on page 5 of the specification. From these equations, it can be seen that the protection diode area depends in part on the gate area of the buffer and in part on the dimensions of the conductive signal line. Therefore, these equations and the descriptions thereof provide support for the phrase “at least partially dependent” in claims 4, 7, 13 and 17.

With respect to claims 9 and 19, which refer to the diode gate size being at least partially dependent on the IC process used to design the IC, the specification clearly indicates on page 5 that the protection diode gate size depends on the process used because the parameters, such as conductor line volume and buffer gate area size, will vary from process to process, although Equations 1 – 3 will still apply regardless of the process used. Page 5, line 25, explicitly states that the antenna ratio, which is related to the size of the protection diode is process-dependent and vendor-dependent. Accordingly, the Applicants respectfully request that this rejection be withdrawn.

Rejection of Claims 1 and 10 under 35 USC §102(b) – Prior Art

Claims 1 and 10 are rejected under 35 USC §102(b) as being anticipated by applicants' admitted Prior Art. The Examiner's characterization of the admitted prior art is correct. However, prior to the invention, the protection diodes were never part of the buffer itself, as the admitted prior art indicates.

In order for a claim to be anticipated, the prior art must disclose every element in the claim. Although it was known to place the diodes, when it was determined that they were needed, on the conductor lines close to the buffers, often times this could not be done because a suitable location could not be found for the diodes. Sometimes a location for a protection diode could be found, but it would not be close to the buffer, thus limiting the diodes effectiveness.

The present invention eliminates this problem because the buffer cell includes the diode. Therefore, when a repeater insertion tool is used during the design phase to insert buffers in the IC design, the protection diodes are automatically inserted as part of the buffer cell. As a result, there is never a problem with finding a suitable location for a protection diode. This is not taught or suggested by the admitted prior art or any of the prior art of record. Claims 1 and 10 have been amended to more clearly indicate that the protection diode is part of the buffer itself. Accordingly, the Applicants respectfully request that this rejection be withdrawn. New claim 21 also includes this aspect of the invention in that it recites insertion of a buffer cell that includes a protection diode coupled to an input of a first inverter of the buffer.

Rejection of Claims 1 – 3, 5, 10 – 12 and 16 under 35 USC §103(a) – Cleveland et al. in view of Sigal

Claims 1 – 3, 5, 10 – 12 and 16 are rejected under 35 USC §103(a) as being unpatentable over Cleveland et al. (5,969,929) in view of Sigal (5,910,730). The Examiner states that Cleveland et al. discloses a protection diode coupled to an input of a buffer, but does not disclose the buffer's circuitry. The Examiner relies on Sigal for its disclosure of a buffer circuit. As

stated in the Background of the Invention in the present application, buffers and protection diodes are known and it is known to connect protection diodes along signal lines preceding buffers. It is not known, however, to incorporate protection diodes into buffers so that when an integrated circuit is being designed, insertion of the buffer automatically corresponds to insertion of a buffer that includes a protection diode connected to the input of the buffer.

As stated above, independent claims 1 and 10, as amended, and new claim 21, recite that the buffer includes the protection diode. These claims also refer to an integrated circuit. For a claim to be obvious in view of a combination of prior art references, there must be a suggestion for combining the references and the combination must teach each and every element of the claim. The Applicants respectfully submit that there is no suggestion for combining the teachings of Kleveland et al. with those of Sigal and that the combination does not teach the present invention as recited in the claims.

Kleveland et al. is directed to printed circuit boards whereas Sigal is directed to a circuit inside of an IC. Because these are completely different technologies that require that different design considerations be taken into account, the Applicants respectfully submit that there is no suggestion for combining the references. Sigal does not even remotely suggest using protection diodes for any reason and Kleveland uses them in conjunction with impedance elements on traces on a PCB in between a transmitting and a receiving IC to provide electrostatic discharge (ESD) protection for the ICs. They are not used to prevent electrical charge from building up on the transistor gates of a buffer of an IC to protect the buffer, as recited in the independent claims of the present application. Sigal does not even mention using protection diodes in conjunction with buffers, much less using them to prevent the buffer from being damaged by charge that collects on the transistor gates of the buffer. Therefore, although the Applicants believe that the combination is inappropriate, the combination still does not teach the present invention as recited in the independent claims, i.e., the protection diode being part of the buffer. Accordingly, the Applicants respectfully submit that the rejection is inappropriate and request that it be withdrawn.

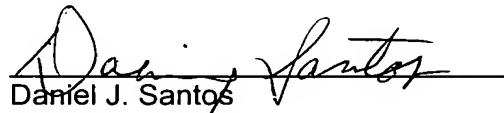
***Rejection of Claims 4, 7, 8, 13, 17, and 18 under 35 USC §103(a) –
Kleveland et al. in view of Sigal, and further in view of Shiota***

Claims 4, 7, 8, 13, 17, and 18 are rejected under 35 USC §103(a) as being unpatentable over Kleveland et al. (5,969,929) in view of Sigal (5,910,730), and further in view of Shiota (5,426,322). As with Kleveland et al., Shiota is also directed to using protection diodes to provide ESD protection for the input circuits of an IC. The major difference between the inventions disclosed in these references is that the ESD protection devices disclosed in Kleveland et al. are outside of the IC along traces that connect ICs on a PCB, whereas the ESD protection devices disclosed in Shiota are formed in the IC. Nevertheless, none of these references is directed to using protection diodes in buffers of ICs that are connected to signal lines to reduce signal delay, where the protection diodes are used to protect their respective buffers from charge that collects on transistor gates of the buffers. Therefore, the combination does not teach the present invention as recited in the claims. Therefore, since claims 4, 7, 8, 13, 17 and 18 all depend either directly or indirectly from one of the independent claims, which all recite the aforementioned features of the present invention, the Applicants respectfully request that this rejection be withdrawn.

CONCLUSION

For the reasons set forth above, it is respectfully submitted that all pending claims are now in condition for allowance, and Applicants request that a Notice of Allowance be issued in this case. Should there be any further questions or concerns, the Examiner is urged to telephone the undersigned to expedite prosecution.

Respectfully submitted,
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